Performance, IT maturity and offshoring behaviour of Italian manufacturing corporations in the dire straits of globalisation

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April 2008

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Abstract

This study examines productivity and profitability of Italian manufacturing corporations in relation to IT usage and offshoring of intermediate goods. The information set is based on a balanced panel of enterprises' economic accounts and foreign trade statistics for the years 2000-2004, linked to 2002 and 2004 surveys on ICT usage. The analytical framework is similar to one previously developed for Sweden, allowing for (partial) comparability. Offshoring is positively related to productivity, although the significance of intensity variables depends on employment size and industry. The same occurs for some variables of IT maturity (workers using PCs and a composite indicator), and for human resources as proxied by cost of labour (i.e. wage levels). These variables also show a positive impact on profitability, although limited to productions which are easy to outsource. Offshoring decisions and IT maturity, instead, do not present any strong mutual relation. The key issue of the direction of causality between IT maturity, offshoring and productivity is also tentatively addressed: lagged offshoring appears to weakly impact productivity, while lagged IT maturity does not, and a reverse causality from productivity to IT maturity is revealed. This first evidence, albeit limited, challenges some commonplaces, suggesting the coexistence of different business models. A richer information set should allow for a more appropriate treatment of these issues, as well as for extending the analysis to other, crucial determinants of performance.

Keywords: Firm behaviour, productivity, profitability, IT usage, offshoring, industrial studies, Manufacturing, Italian economy

JEL Codes: D21, L24, L25, O14, O33

[§] This paper was included in the Final Report of the project *ICT impact assessment by linking data across sources and countries*, which benefited from a grant of the European Commission. The full report is available on Eurostat website, at the URL http://epp.eurostat.ec.europa.eu/portal/page/portal/information_society/documents/49102.2005.017-2006.128%20-%20ICT%20IMPACTS%20-%20FINAL%20REPORT%20V2.pdf

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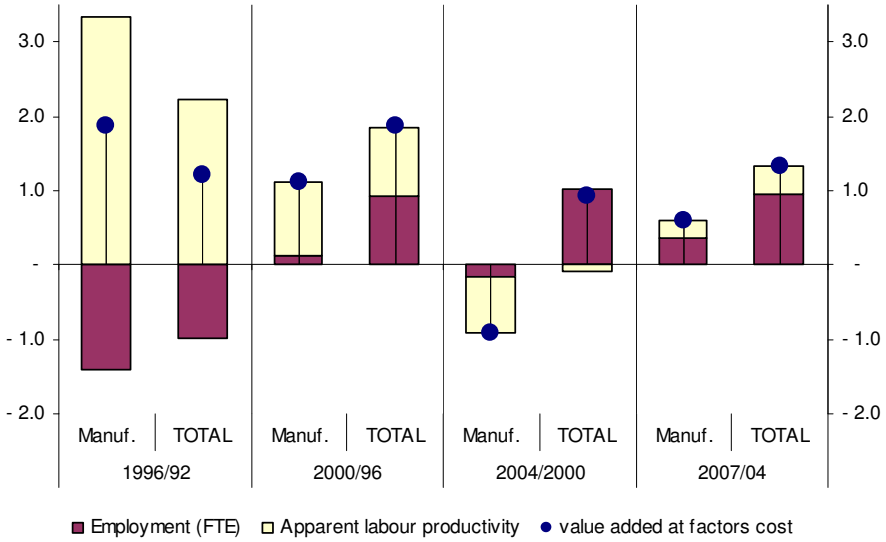
1. Setting the scene

This paper investigates relationships linking IT maturity and offshoring with productivity and profitability in Italian manufacturing firms. An empirical analysis is performed on micro-data for the years 2000-2004, which correspond to the deployment of the first *globalisation-induced crisis* hitting the Italian economy.

Indeed, with respect to the other large EU countries, Italy is characterised by strong specialisation in labour intensive/low technology manufacturing, more exposed to price competition from emerging economies. With specific reference to these 'traditional' industries, offshoring can be viewed as a channel for the survival of enterprises via cheaper labour (letting home only a few functions), while the motivations of markets conquest and acquisition of technologies are deemed more important in other sectors. In all cases, though, the impact of offshoring on productivity is likely to be mediated by and to go along with other factors, such as labour market arrangements.

In practice, after the business cycle peak of year 2000, the Italian economy underperformed vs. both historical records and nearly all EU countries. Unlike in previous crises, employment proved resilient, resulting in a prolonged stagnation of labour productivity, which fell for the first time in manufacturing (Figure 1).

Figure 1 – Italy: dynamics of employment, value added and productivity. Yearly % change, 1993-2007



Enterprises managed to partly compensate for the drop in profits (associated to the decrease in value added), by keeping wages low (see i.a. Tronti, 2007).[1] The period 2000-2004, however, was also marked by a strong restructuring and selection process in Italian manufacturing industries, with a decrease of about 6.6 percent in the number of firms, contrasted to a growth of 0.6 percent for the rest of the EU25.[2]

[1] Profitability rates, however, fell with respect to capital, labour and labour costs alike (de Panizza, Calza and Rossetti, forthcoming)

[2] The comparatively large number of micro-enterprises in Italy is mirrored in an average employment size much lower than the EU and, correspondingly, swells the country share in the population of EU manufacturing firms up to an astonishing 25 percent. The shrinking in the population of Italian firms, thus, resulted in a reduction of 1.2 percent for the whole of the EU25, which hinders an otherwise positive variation.

Here, we address the role of internationalisation and IT usage on the way firm performed in productivity and explore their impact on profitability which, in turn, corresponds to higher chances of survival and development.

The analytical framework is developed starting from that used with respect to Sweden by Hagsten *et al* (2008), and it is rooted in previous and ongoing work on offshoring.[3] In a nutshell, the presence and intensity of offshoring is recorded by tracking the purchase of intermediate goods from abroad, and it is inserted within a Cobb-Douglas type log-linearized production function as an explanatory variable of (apparent labour) productivity, measured as value added per person employed.

The main features of the dataset and descriptive results are presented in Section 2, key analytical results are discussed in Section 3, and some concluding remarks are sketched in Section 4.

2. Features of the dataset and descriptive analysis

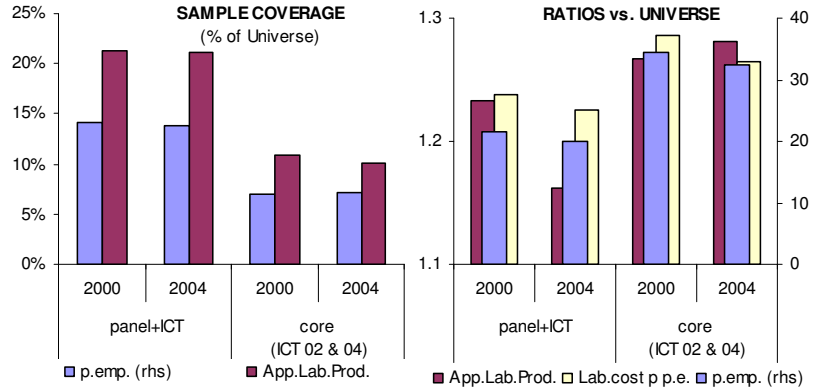
The dataset used in regression analysis consists of 4745 records referring to 3633 enterprises. This results from the merging of 2002 and 2004 ICT usage surveys in enterprises (each with about 10thousand respondents) with a balanced panel reporting information from 2000 to 2004 on economic accounts plus offshoring for about 45 thousand manufacturing corporations (other firms are excluded, due to the lack of economic accounts). Issues of causal direction and of changes along time are addressed by means of a derived (core) dataset, which includes 1144 enterprises responding to both ICT surveys, 1551 hit in 2002 only and 938 in 2004 only. Lacking direct information on the quality of human resources, average labour cost per person employed was used as a proxy. The analysis is limited to the purchase of intermediate goods in manufacturing, as no comparable data on services were available.

Due to the mix of these features the dataset, and all the more so its core subset, are clearly biased towards the upper end of the employment size distribution of firms, and (partly in relation to the above) distorted with respect to industrial composition. The smallest firms are outside the observation field of ICT surveys, and corporations are typically more robust and 'modern' than unincorporated firms of the same size. Hence, full representativeness of the industrial system could not be achieved, even by weighting regressions, which we do not do here. The issue, however, is not to be regarded as negative. Although including only the 0.65 percent of firms, the dataset covers about 15% of employment and more than one fifth of turnover in manufacturing. Basically, firms portrayed in the dataset are those driving the whole of manufacturing. Indeed, with respect to the universe of manufacturing enterprises with 10+ persons employed these firms are relatively more productive (across all industries), and score higher in both IT maturity and offshoring intensity. On this latter aspect, we can contrast them only with the original panel in which, however, about 30 per cent of firms were to some extent engaged in offshoring (Figure 2).

[3] First proposed by Hagsten and Karpaty (2006), partly followed in de Panizza, Calza and Rossetti (2007), and *ibid.* (forthcoming)

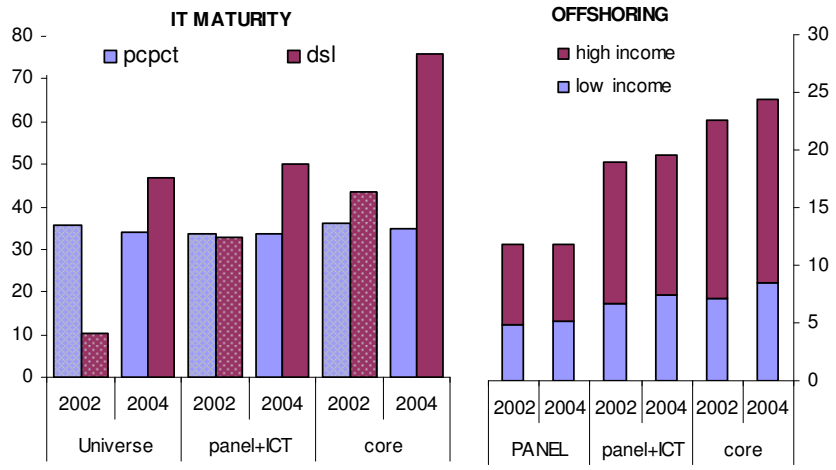
Figure 2 - Features of the merged dataset:

A. Coverage and economic ratios



Legend: persons employed, apparent labour productivity and labour costs per person employed

B. IT Maturity and Offshoring behaviours



Legend: percentage of employees using a Pc, availability of xDsl connection;

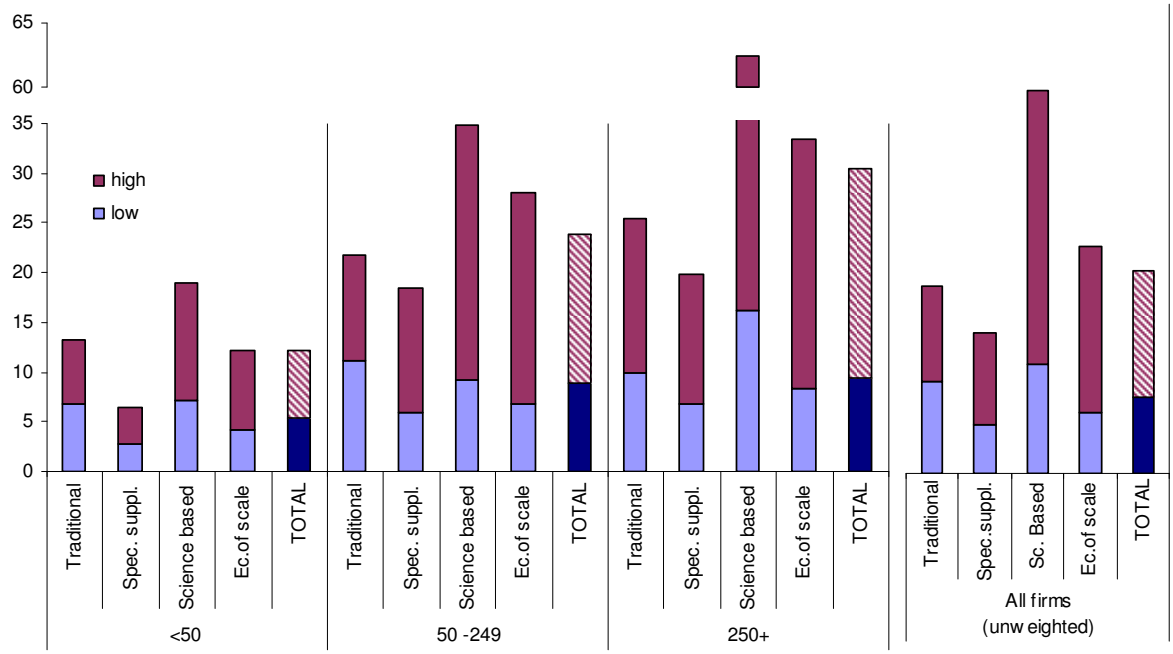
Impacts of employment size and of industry specificities are addressed by including a variable for employment, and by treating separately four groups of industries according to a Pavitt-like taxonomy.[4] The latter allows broadly distinguishing industries according to their patterns with respect to productivity, market dynamics and some behavioural features. In addition, NACE four digits dummies are used within each group, as well as dummies for geographical location and multinationality of enterprises.

As expected, offshoring intensity is clearly dependent on employment size of firms and on their main industry, so that large firms and those operating in hi-tech industries and in sectors characterised by economies of scale rank comparatively high. When we consider localisation, it is also evident that

[4] Following Pavitt (1984), economic sectors can be grouped into four clusters according to their features with respect to innovation & knowledge. Hereunder a slight departure from the original taxonomy is adopted, with an eye to market dynamics, as follows: "Traditional" industries (in Pavitt's phrasing, *Supplier dominated*), including food and beverages, textiles and apparel, footwear, paper and printing, and wood industry, plus, in this paper, also furniture, metal works, and non metal mineral products; "specialised suppliers" including machinery and equipment plus part of the electronic industry; science based, including IT, pharmaceuticals, and aeronautics; plus "scale intensive" productions. The latter present some similarities with traditional industries, in as cost reduction is a key objective of innovation, which also has a relatively low degree of appropriability. These similarities (and, by contrast, those between the two other groups), are quite evident also in the results of the analysis hereunder.

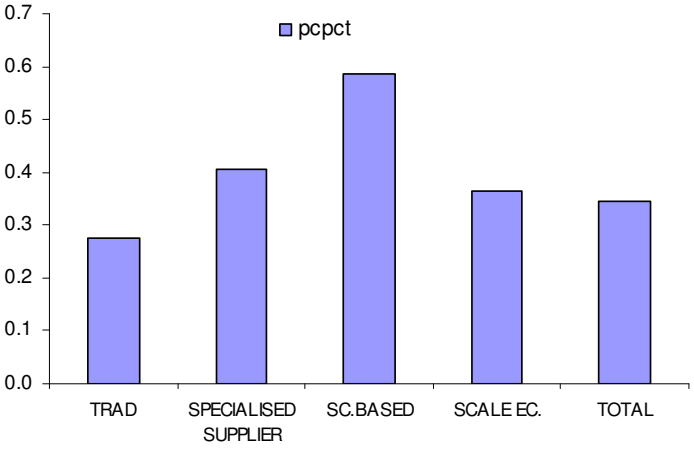
firms in traditional low-tech sectors exposed to competition of emerging economies are leading in offshoring to low income countries (Figure 3).

Figure 3 –Industry and employment size vs. intensity of offshoring to high and low income countries



With respect to IT maturity, instead, things are not straightforward, as larger firms are likely to score higher when variables such as *DSL* are considered, but also to have comparatively larger shares of blue-collars, so that no differences can be traced with respect to the percentage of workers using PCs (see above, Figure 2B). With respect to this latter aspect, instead, a clear sectoral hierarchy emerges, with high tech industries far at the top and traditional ones detached at the bottom (Figure 4)

Figure 4 – Impact of Industry on IT maturity: percentage of workers using PC, year 2004



Variables available from ICT usage surveys present obvious overlapping, and only some of them are able to discriminate among enterprises and *prima facie* present a direct relationship with performance (Table 1). Amongst these, the percentage of workers using PCs proved clearly superior (a finding in line with a previous work on macroeconomic performance at the international level, see de Panizza and Visaggio, 2007), followed by xDSL and intranet usage. These facts respond to the logical hierarchy among usage indicators, partly visible in cross-correlations. A composite indicator of IT maturity obtained by summing all variables[5] shows the highest correlation with productivity.

[5] IT_Maturity = (Pc*pcpct+inter*interpct+dsl+web+intra*intrapct+epurch*epurchpct+esales*esalespct).

However, the additional explanatory power of this and other composite indicators tested (in particular, focusing on PC usage and DSL) resulted really minimal, so that, also for presentation purposes, individual variables are used in regression analysis hereunder. These stylised facts are exemplified in Table 1 for the whole dataset, without considering sector/size specificities (see, i.a., above) and time differences (for instance, in 2004 pc usage proved more significant than the composite for some size classes and industries). It is also worth noting that profitability (defined as gross profits per unit of capital) is mildly related to productivity, while IT maturity variables do not seem to have any impact on it.

Table 1 – simple correlations among productivity, profitability and IT maturity variables

	logprod	Profitability	IT maturity	pc usage %	Internet	Internet %	xDSL	intranet	Intranet %	web	Epurchases	Epurchases%	Esales	Esales%
Ln(productivity)	1.00													
Ln(profitability)	0.29	1.00												
IT (composite)	**0.39**	0.02	1.00											
pc usage %	**0.34**	0.08	**0.69**	1.00										
Internet	0.17	-0.05	0.36	0.17	1.00									
Intenet%	0.24	0.08	0.63	**0.70**	0.23	1.00								
xDSL	**0.28**	-0.01	**0.72**	0.27	0.24	0.26	1.00							
Intranet	0.25	-0.01	**0.53**	0.27	0.22	0.22	0.35	1.00						
Intranet%	**0.33**	0.05	**0.72**	**0.70**	0.17	0.53	0.35	**0.74**	1.00					
web site	0.17	-0.04	**0.63**	0.19	0.36	0.20	0.25	0.24	0.22	1.00				
Epurchases	0.11	0.00	0.29	0.16	0.10	0.15	0.22	0.20	0.21	0.16	1.00			
Epurchases %	0.05	0.01	0.16	0.06	0.03	0.05	0.10	0.09	0.09	0.06	0.31	1.00		
Esales	0.13	0.01	0.25	0.10	0.09	0.09	0.19	0.15	0.15	0.13	0.21	0.18	1.00	
Esales%	0.11	0.02	0.23	0.09	0.05	0.06	0.15	0.13	0.13	0.06	0.14	0.18	**0.60**	1.00

3. Linking behaviour with performance: results of regression analysis

Italian foreign trade stagnated for most of the period under exam, with respect to both exports and imports. Considering the 45 thousand firms in the base panel, their percentage involved in imports of intermediates grew marginally, but showed some changes in the pattern of import intensity, with a rebalancing from high to low income countries and some related sectoral differences.

Delocalisation became more important for corporations operating in traditional industries (apparel, shoes, iron works, tiles, and furniture). Firms in other sectors either slightly reduced their internationalisation overall or, in industries with positive returns to scale, they increased it marginally and, again, mainly in emerging economies.

Initially, results obtained with a basic model (K, L, human resources, offshoring & IT maturity) were overall quite similar to those obtained for Sweden, both in terms of the model overall explanatory power (about 30% of variability) and to some of its key components. In particular, and as expected, human resources and capital intensity were the most relevant factors, although the influence of capital intensity on productivity is not significant in both science based and scale intensive industries. Offshoring too proved weak, in particular when to low income countries.

A marked improvement on the overall explanatory power (to values approaching 60%) was obtained by excluding from the analysis the few cases for which (log) productivity was not positive, but with no significant changes on the significance of individual variables (Table 2).[6]

[6] Apparent labour productivity can be negative, due to its definition.

Table 2 - impacts on Productivity from production mix, offshoring and IT maturity (years 2002 & 2004):

Dependent variable: Ln of labour productivity		**TOTAL**	TRADITIONAL	SPEC.SUPPLIERS	SC.BASED	SCALE INTENSIVE
Business size (Ln of Employment)		**-0.04 (0.008)*** **	-0.03 (0.01)***	-0.02 (0.013)	-0.09 (0.037)**	-0.05 (0.012)***
Human Resources (Ln of Labour cost p.p.e.)		**0.89 (0.082)*** **	1.05 (0.05)***	0.75 (0.057)***	1.04 (0.113)***	0.95 (0.044)***
Capital intensity (Ln of Capital p.p.e.)		**0.09 (0.007)*** **	0.10 (0.009)***	0.10 (0.015)***	0.04 (0.023)*	0.08 (0.012)***
Vert.Integr. (Share of VA on turnover)		**0.19 (0.028)*** **	0.24 (0.041)***	0.07 (0.039)*	0.31 (0.16)*	0.21 (0.042)***
IT MATURITY	% employees w/pc	**0.16 (0.032)*** **	0.21 (0.05)***	-0.03 (0.075)	-0.15 (0.149)	0.14 (0.044)***
	% emp. w/internet	**0.02 (0.04)**	0.04 (0.074)	0.14 (0.083)*	0.15 (0.134)	-0.07 (0.065)
	Dsl (y/n)	**0.01 (0.012)**	-0.01 (0.019)	0.03 (0.028)	0.01 (0.065)	0.01 (0.019)
	E-sales (y/n)	**0.02 (0.017)**	0.03 (0.027)	0.09 (0.04)**	0.12 (0.128)	-0.01 (0.025)
	E-purchases (y/n)	**0.00 (0.015)**	-0.04 (0.024)	0.02 (0.025)	0.10 (0.057)*	0.02 (0.027)
	E-sales (% turnv.)	**0.02 (0.062)**	-0.05 (0.14)	0.28 (0.16)*	0.03 (0.308)	0.01 (0.074)
	E-purch (% turnv)	**0.14 (0.081)***	0.18 (0.13)	-0.36 (0.122)***	0.19 (0.317)	0.24 (0.107)**
OFFSH-ORING	Low income	**0.02 (0.004)*** **	0.03 (0.007)***	-0.02 (0.01)	-0.00 (0.017)	0.03 (0.008)***
	High income	**0.03 (0.004)*** **	0.02 (0.006)***	0.02 (0.01)**	0.03 (0.017)*	0.04 (0.007)***
GEO LOC.	North-West	**0.01 (0.015)**	0.02 (0.023)	-0.00 (0.032)	-0.06 (0.075)	-0.01 (0.028)
	North-East	**0.03 (0.014)** **	0.02 (0.021)	0.07 (0.033)**	0.11 (0.064)*	0.00 (0.027)
	South	**-0.07 (0.02)*** **	-0.10 (0.029)***	-0.13 (0.051)**	-0.12 (0.097)	-- --
MNC (y/n)		**0.05 (0.014)*** **	0.03 (0.022)	0.01 (0.03)	0.10 (0.063)	0.05 (0.019)***
Year =2002		**0.04 (0.011)*** **	0.06 (0.017)***	0.02 (0.024)	-0.02 (0.045)	0.06 (0.017)***
No.		**4745**	2225	723	256	1541
R2		**0.647**	0.655	0.695	0.674	0.616

Note: Heteroskedasticity-consistent standard errors in brackets; ***, **, * = variables significant at the 1, 5 and 10 percent levels, respectively. Unreported four-digit industry dummies always included. All firms have at least 10 persons employed and apparent labour productivity > 0 & <500k€

Business size usually is positively related to productivity, but here the impact results significantly negative, overall and for most industries, once controls for other aspects are introduced. This is not surprising, in as smaller firms in the sample are likely to be 'the best' in their class. Our proxy for ***Human resources*** (labour cost per person employed), instead, has a strong positive impact across all industries, and ***Capital intensity*** too drives productivity, although the evidence appears weaker for the group of science based industries.

Both types of ***offshoring*** overall were significant at the 1% level. However, the positive impact on productivity of *offshoring to low income countries* is significant only for traditional and scale intensive productions – thus confirming common sense evidence – while that of *offshoring to high income countries* is significant in all industries, though only to a limited extent for science based ones.

Amongst **IT maturity** variables, as anticipated, only the *percentage of employees with a Pc* is significant overall (at the 1% level). The latter, however, does not show any clear impact for science based and specialised supply industries. *E-purchases* variables show a mixed impact across industries. The intensity variable (% of turnover) presents a positive association with productivity in industries where economies of scale are relevant (ability to trade inputs globally) and negative in specialised supply industries, who are also the only group for which *E-sales* show a positive and significant impact. These results are in line with the evidence suggested in a previous study for manufacturing of machinery and equipment (Becchetti, de Panizza and Oropallo, 2007), that in this specific industry sub-contractors are not necessarily on the lowest ladder of the value chain. x*Dsl*, finally, now does not seem to be relevant for any type of business, as this variable does not discriminate in our sample, where *pioneers* are overrepresented with respect to the whole economy.

The introduction of a variable for ***vertical integration*** (share of value added on turnover, i.e. the complement of overall purchases of intermediate goods & services) also proved to impact productivity, and contributed to differentiate results for offshoring to low income countries. Finally, the introduction of dummies for ***multinationals***, for (NUTS1) ***geographical location of enterprises*** and for year of reference improved results only marginally with respect to basic regressions (not reported). Nonetheless, all these variables were overall significant, with MNCs and enterprises located in northern regions clearly more productive than enterprises with only local branches and/or located in the South, and framework conditions easier in 2002 than in 2004.

A highly tentative exercise to address **the issue of causality** was carried out on the core subsample of corporations responding to both 2002 and 2004 ICT surveys and, where possible, on the larger sample of respondents to the 2004 surveys for which we have economic accounts for the previous years. Some basic regressions were performed for 2004, with the aim of checking whether lagged variables had any impact. An important limitation to the interpretation of results arises from the fact that, in the period under exam, only IT maturity (pc usage) moved fast, while offshoring progressed little and, in aggregate terms, productivity in 2004 slowed down to the same level of 2002.

A first test, addressing the IT maturity - productivity nexus, showed that, controlling for other variables, lagged (2002) PC usage and composite IT usage proved to be irrelevant in explaining productivity, while lagged (2002) productivity was significant, although weakly, in determining PC usage (table 3).

Table 3: Test on the direction of causality between Productivity and IT Maturity plus Offshoring

EXPLANATORY VARIABLES	**Pc Usage intensity (% of workers) *& lagged productivity***			
	CORE SAMPLE		LARGER SAMPLE	
Ln Productivity	0.06	(0.03)**	0.07	(0.02)***
Ln Productivity 2002	0.02	(0.03)	0.02	(0.01)*
Ln employment	0.01	(0.01)	0.00	(0.01)
Ln Capital	0.00	(0.01)	0.00	(0)
Ln Labour cost	0.05	(0.04)	0.06	(0.04)
Ln Vertical integration	-0.07	(0.02)***	-0.08	(0.01)***
Ln Offshoring (total)	0.00	(0.01)	0.00	(0)
Multinationality	0.03	(0.01)**	0	(0.01)***
No	1134		2060	
R squared	0.489		0.468	

	Productivity					
	& Lagged IT maturity		*& Lagged Offshoring*			
IT Maturity	0.27	(0.07)***	0.22	(0.08)***	0.31	(0.06)***
IT Maturity 2002	-0.05	(0.06)			…	…
Ln employment	-0.02	(0.01)**	-0.03	(0.01)**	-0.02	(0.01)
Ln Capital	0.08	(0.01)***	0.08	(0.01)***	0.09	(0.01)***
Ln Labour cost	0.76	(0.08)***	0.76	(0.08)***	0.80	(0.09)***
Ln Vertical integration	0.19	(0.04)***	0.19	(0.04)***	0.23	(0.04)***
Ln Offshoring (total)	0.05	(0.01)***	0.04	(0.01)***	0.03	(0.01)**
Ln Offshoring (total) 2002			0.02	(0.02)	0.02	(0.01) o
Multinationality	0.02	(0.03)	0.02	(0.03)	0.02	(0.02)
No	1134		1134		2060	
R squared	0.728		0.730		0.686	

Note: only enterprises with productivity [0, 500thousand €]. Sectoral & geographical dummies always included, as well as other IT variables

The (absence of) influence of lagged IT maturity on productivity was confirmed also in more detailed sector/size analysis. This result, to be regarded as very preliminary, suggests that the relationship between (historical) IT maturity and productivity is mediated by other aspects, while that from (historical) productivity to IT maturity points at the coexistence of different business models, with those grounded on productivity corresponding to a more dynamic behaviour with respect to IT (productive) usage.

A twin exercise addressing the issue of the direction of causality between offshoring and productivity, instead, reveals that lagged offshoring is weakly significant for productivity (12-14%), while the opposite does not hold (unreported). In other words, results confirm that enterprises transforming themselves through offshoring later on improved their probability to rank high in productivity, while of course it is not at all obvious that firms at the top of productivity would later on, due to this, become offhsorers.

It is worth adding that, in both exercises, the significance of lagged (T-2) offshoring (vs. productivity) and productivity (vs. IT maturity) was higher in larger samples, where smaller firms weight more, and was further improved when current variables were excluded, using T-1 values instead.

A similar question was addressed with respect to offshoring: can we infer an influence of IT maturity in offshoring decisions (or vice versa)? Regression results reported in Table 4 show no clear impact, in both directions. Among other variables, human resources, multinationality and (negative) vertical integration are relevant in both cases, while business size is significant for offshoring decisions, but does not show any significant impact on IT maturity.

Table 4: Cross relationships between offshoring & IT maturity in 2004

(Including lagged variables)

OFFSHORING	Betas	St.err.	**IT MATURITY**	Betas	St.err.
p.empl. using a pc (%)	0.12	(0.29)	**Total Offshoring**	0.00	(0.01)
p.empl. using a pc (%)2002	0.29	(0.22)	**Total offshoring 2003**	0.00	(0.01)
			Total offshoring 2002	0.01	(0.01)
Business size (Ln of Employment)	0.38	(0.04)***	>>	0.00	(0.01)
Human Resources (Ln of Labour cost p. p.e.)	0.34	(0.13)***	>>	0.10	(0.04)***
Capital intensity (Ln of Capital p.p.e.)	0.15	(0.05)***	>>	0.01	(0.01)
Vert.Integr. (Share of VA on turnover)	-0.56	(0.1)***	>>	-0.06	(0.02)***
Multinationality	0.20	(0.1)**	>>	0.04	(0.01)***
Localisation / North	0.12	(0.17)	>>	-0.01	(0.02)
Localisation / North East	0.19	(0.17)	>>	0.04	(0.02)*
Localisation / Centre	-0.05	(0.19)	>>	0.02	(0.03)
No	*1134*				
Rsq.	*0.523*		>>	*0.481*	

Note: dependent variables = total offshoring; % of persons employed using a pc

Finally, it is worth discussing whether **IT maturity and offshoring** do have any **impact on the profitability of firms** which is what counts for the entrepreneur and makes the firm survive. To this end, profitability (gross profit per unit of capital) was estimated by means of the previous set of predictors, with mixed results (Table 5).

Table 5: impacts on Profitability from production mix, offshoring and IT maturity (years 2002 & 2004):

		TOTAL	TRADITIONAL	SPEC.SUPPLIERS	SC.BASED	SCALE INTENSIVE
Business size (Ln of Employment)		-0.04 (0.01)***	-0.05 (0.01)***	-0.02 (0.02)	-0.07 (0.03)**	-0.04 (0.01)***
Human Resources (Ln of Labour cost p. p.e.)		0.32 (0.09)***	0.50 (0.05)***	0.13 (0.05)**	0.49 (0.19)**	0.45 (0.09)***
Capital intensity (Ln of Capital p.p.e.)		-0.34 (0.02)***	-0.30 (0.02)***	-0.32 (0.02)***	-0.36 (0.05)***	-0.42 (0.06)***
Vert.Integr. (Share of VA on turnover)		0.04 (0.02)	0.04 (0.03)	0.05 (0.06)	0.05 (0.11)	0.07 (0.04)*
IT MATURITY	% emp. w/pc	0.17 (0.04)***	0.24 (0.05)***	-0.04 (0.12)	-0.28 (0.24)	0.13 (0.07)*
	% emp. w/intern.	-0.09 (0.06)	-0.08 (0.09)	0.10 (0.14)	0.05 (0.21)	-0.14 (0.09)
	Dsl (y/n)	0.01 (0.02)	-0.02 (0.02)	0.05 (0.04)	0.02 (0.08)	0.03 (0.03)
	Esales (y/n)	0.01 (0.02)	0.02 (0.04)	0.07 (0.06)	0.09 (0.21)	-0.01 (0.03)
	Epurch (y/n)	0.00 (0.02)	-0.02 (0.02)	0.01 (0.04)	-0.04 (0.11)	0.01 (0.03)
	Esales (% turnv.)	0.09 (0.1)	0.20 (0.18)	0.41 (0.23)*	0.00 (0.44)	-0.01 (0.13)
	Epurch (% turnv)	0.12 (0.13)	0.18 (0.17)	-0.43 (0.2)**	0.95 (0.89)	0.11 (0.12)
OFFSH-ORING	Low income	0.02 (0.01)***	0.01 (0.01)*	0.02 (0.02)	-0.02 (0.04)	0.04 (0.01)***
	High income	0.06 (0.02)***	0.04 (0.03)	0.03 (0.04)	0.13 (0.09)	0.06 (0.03)**
GEO LOC.	North-West	0.01 (0.02)	0.03 (0.03)	0.00 (0.05)	-0.14 (0.12)	-0.09 (0.08)
	North-East	0.03 (0.02)*	0.03 (0.02)	0.07 (0.05)	0.12 (0.1)	-0.08 (0.07)
	South	0.02 (0.04)	0.01 (0.04)	-0.05 (0.06)	-0.08 (0.12)	-- --
MNC (y/n)		0.02 (0.01)**	0.02 (0.01)**	-0.02 (0.02)	0.00 (0.04)	0.02 (0.01)**
Year =2002		0.03 (0.02)**	0.04 (0.02)**	0.04 (0.03)	-0.10 (0.08)	0.06 (0.03)**
No.		4692	2193	715	251	1533
R2		0.469	0.440	0.437	0.458	0.560

Offshoring has a strong impact on profitability. However, this is due only to scale intensive productions, and to a limited extent to traditional industries for offshoring to low income countries. When it comes to ***IT maturity***, again, the indicator for the intensity of PC usage is the only whose impact is overall significant, due to traditional and to a lesser extent to scale intensive industries, in a similar fashion to what we found for productivity. Amongst other variables, it is worth noting that while the proxy for ***human resources*** present a positive and significant correlation with profitability throughout different industries, the opposite happens for ***capital intensity***. Multinationality seems to add a plus to profitability, but only in traditional and scale intensive sectors, while geographical location and vertical integration do not show any significant impact.

4. Concluding remarks

The analysis proposed in this paper for Italian manufacturing corporations provides new evidence confirming that skills and capital intensity are key determinants of productivity. Offshoring and IT maturity showed both a positive impact on productivity, but the significance of related (intensity) variables depends crucially on industry specificities. They improved profitability as well but, again, this relationship is significant only for easy to delocalise, low tech productions.

Labour skills result to have improved profitability (while capital intensity as such, for the years considered, had a negative impact), and at the same time to have played a role in offshoring and IT usage decisions. These latter two, instead, did not show any clear mutual relationship. Finally, with respect to the key issue of directions of causality, lagged offshoring appears to weakly impact productivity, while lagged IT maturity does not, and a reverse causality from productivity to IT maturity is revealed.

The latter evidence, albeit limited, challenges some commonplaces, suggesting the coexistence (and, for the time being, the viability) of different business models, rather than a strong, unambiguous relationship framing a single techno-economic paradigm. A richer information set (including

innovation, R&D and skills surveys, but also data for service firms) should allow for a more appropriate treatment of these issues, as well as for extending the analysis beyond IT and the offshoring of intermediate goods in manufacturing corporations to other, crucial determinants of performance.

References:

BECCHETTI, L., A. DE PANIZZA AND F. OROPALLO (2007), "Role of Industrial District Externalities in Export and Value-added Performance: Evidence from the Population of Italian Firms", *Regional Studies*, Vol. 41.5, pp. 601–621, July 2007

CALZA, M.G., A. DE PANIZZA AND S. ROSSETTI (2007), "Dinamica dell'internazionalizzazione delle imprese manifatturiere italiane nel periodo 2000-2004", *Rapporto ICE 2006 - 2007 "L'Italia nell'economia internazionale"*, pp. 194-201

CALZA, M.G., A. DE PANIZZA AND S. ROSSETTI (forthcoming), *Internationalisation, economic structure and performance of Italian manufacturing firms*

DE PANIZZA, A. AND M. VISAGGIO (2007), "Key Indicators for the New Economy", *Measuring the New Economy: Statistics Between Hard-Boiled Indicators and Intangible Phenomena*, T. Wolters (ed.), Elsevier Science, Amsterdam

HAGSTEN, E., P. KARPATY AND S. SVANBERG (2006) "Effects on productivity from Swedish offshoring", Statistics Sweden and Orebro University WP

HAGSTEN, E. AND S. SVANBERG (2008) "Offshoring, IT Maturity and Productivity: Evidence from Swedish firm level data", preliminary draft (april)

PAVITT, K. (1984), "Sectoral Patterns of Technical Change: Towards a Taxonomy and a Theory", *Research Policy*, 13: 343-73

TRONTI, L. (2007) "The July Protocol and Economic Growth: The Chance Missed", *Social Pacts, Employment and Growth. A Reappraisal of Ezio Tarantelli's Thought*, Acocella N. and Leoni R. (eds.), Physika-Verlag, Heidelberg